

CHAPTER THIRTEEN

BRAKES

This chapter provides service procedures for the front and rear brake systems, including the brake pads, master cylinder, calipers, discs and brake pedal. Refer to Chapter Three for brake fluid level inspection, brake pad inspection and adjustment of the brake lever and pedal. The front brakes are actuated by the hand lever on the right side of the handlebar. The rear brake is actuated by the brake pedal and left brake lever. The left brake lever is also equipped with a lock that allows it to be used as a parking brake.

When inspecting the brake system, compare any measurements to the brake specification in **Table 1**. Replace any component that is damaged or out of specification. During assembly, tighten fasteners to specifications in **Table 2**. **Table 1** and **Table 2** are at the end of this chapter.

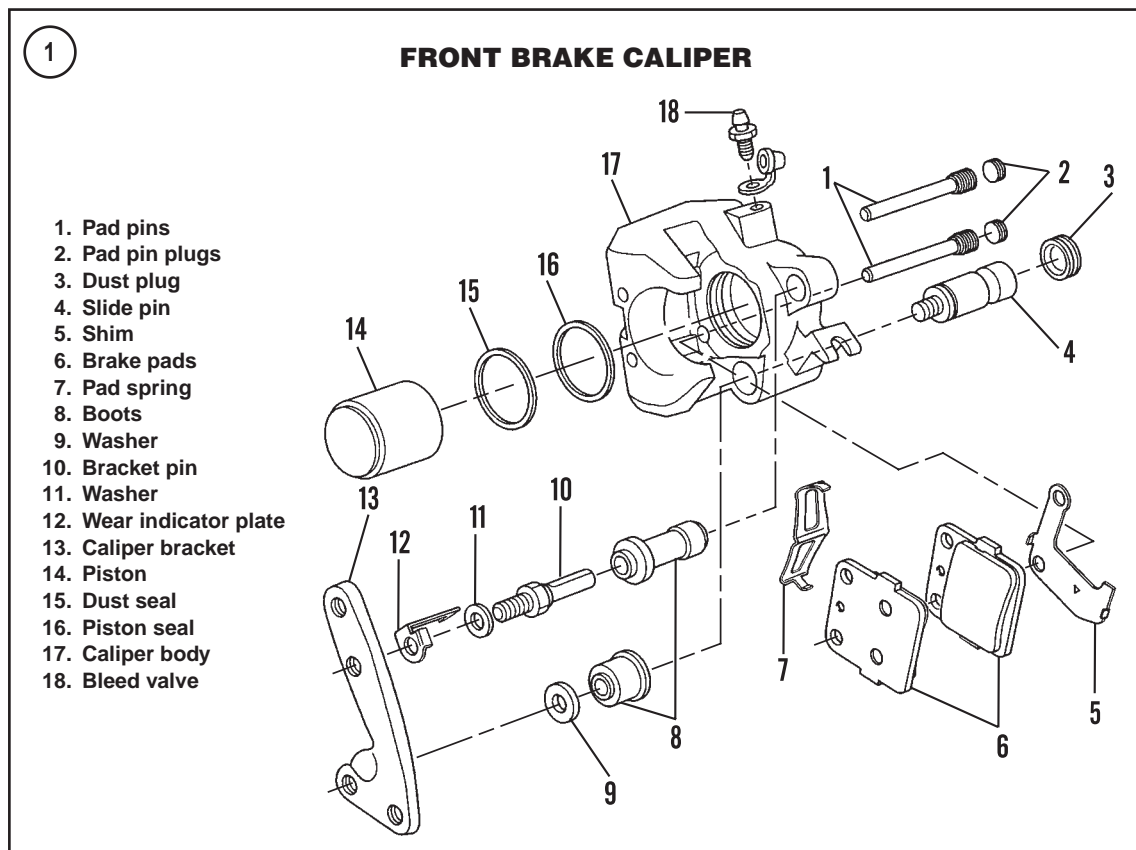
BRAKE SERVICE

The front brakes are hydraulically actuated. When pressure is applied to the brake lever, the brake fluid in the lines is compressed and pushes the brake pads against the brake disc. When pressure is relieved, the pads slightly retract from the disc, allowing the wheel to spin freely. As the pads wear,

the piston in the caliper extends, automatically keeping the pads adjusted close to the disc.

Observe the following when maintaining or working on a hydraulic brake system:

1. Keep brake fluid off painted surfaces, plastic and decals. The fluid damages these surfaces. If fluid does contact these surfaces, flush the surface thoroughly with clean water.
2. Keep the fluid reservoirs closed, except when changing the fluid.
3. Replace brake fluid often. The fluid absorbs moisture from the air and causes internal corrosion of the brake system. Fresh fluid is clear- to slightly-yellow. If the fluid is obviously colored, it is contaminated.
4. Do not reuse brake fluid, and do not use leftover fluid that has been stored in an open container for any length of time.
5. When rebuilding brake system components, lubricate new parts with fresh fluid before assembly. Do not use petroleum-based solvents. These can cause rubber components to swell and damage them.
6. Bleed the brake system when a banjo bolt or other connector in the brake line has been loosened.



FRONT BRAKE PADS

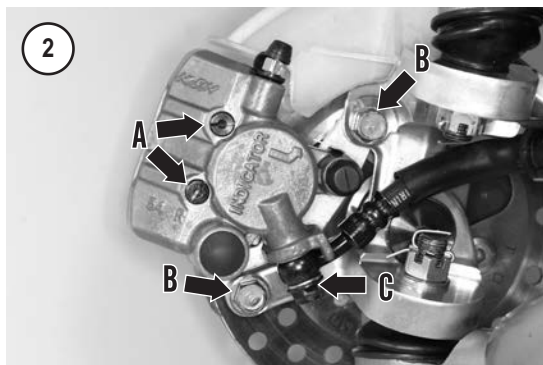
Brake pad life depends on riding conditions and the material used to manufacture the brake pads. Replace the pads when they are worn or have been contaminated with oil or other chemicals. Refer to Chapter Three for brake pad inspection. Always replace pads as a set.

Replacement

It is not necessary to drain the brake fluid from the brake lines when replacing the pads.

Refer to **Figure 1**.

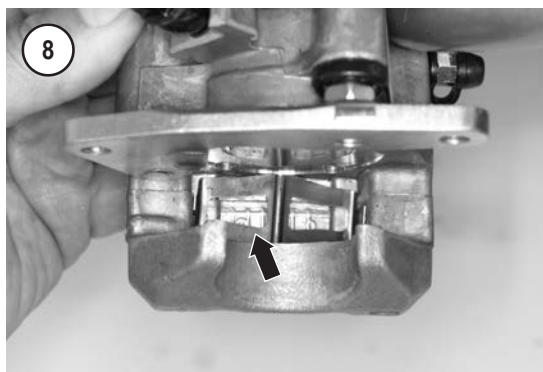
1. Remove the front wheel as described in Chapter Ten.
2. Remove the pad pin plugs (A, **Figure 2**).
3. Loosen the pad pins (**Figure 3**), but do not remove them.
4. Remove the brake hose from the clamp (**Figure 4**) at the upper control arm.
5. Remove the caliper mounting bolts (B, **Figure 2**).



6. Inspect the fluid level in the front brake master cylinder. If overfilled, remove some of the fluid.

CAUTION

The prying action in the following step forces fluid back up the line and into the reservoir. While performing the next step, check the reservoir as the brake piston is pushed back into the caliper. The piston must be pushed back to make room for the new pads.



7. Place a large screwdriver between the old pads and push the brake piston into the caliper (**Figure 5**).

8. Press the brake pads against the pad spring and remove the pad pins (**Figure 6**).

9. Remove the loose brake pads (**Figure 7**).

CAUTION

Do not operate the brake lever with the pads removed. Without the pads in place, the piston can come out of the caliper housing.



10. Make sure the pad spring is properly positioned in the caliper (**Figure 8**). If the spring is broken, rusted or missing, replace it.

11. Clean the interior of the caliper and inspect for leaks or damage.

12. Inspect the pad pins for wear and corrosion. Replace the pins if necessary.

13. Install the new pads into the caliper. The pad with the shim must be installed against the caliper piston (**Figure 9**).

14. Press the pads against the pad spring to align the pad pin holes.

15. Install the pad pins. Do not tighten the pad pins at this time.
16. Install the caliper over the brake disc and align the caliper mounting bolt holes (**Figure 10**).
17. Install *new* mounting bolts and tighten them to 30 N•m (22 ft.-lb.).
18. Install the brake hose (**Figure 4**) into the clamp on the upper arm ball joint.
19. Tighten the pad pins to 18 N•m (13 ft.-lb.).
20. Install and tighten the pad pin plugs to 3 N•m (27 in.-lb.).
21. Operate the brake lever several times to seat the pads.
22. Check the brake fluid reservoir and replenish or lower if necessary.
23. With the front wheel raised, make sure the wheel spins freely and the brake operates properly.
24. Install the front wheel as described in Chapter Ten.

FRONT BRAKE CALIPER

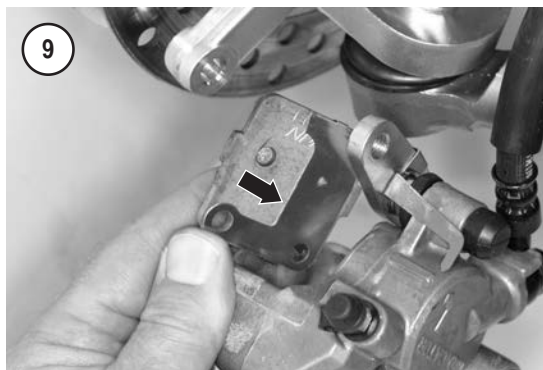
Removal and Installation

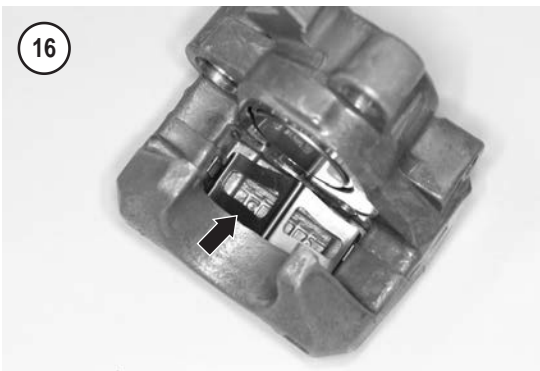
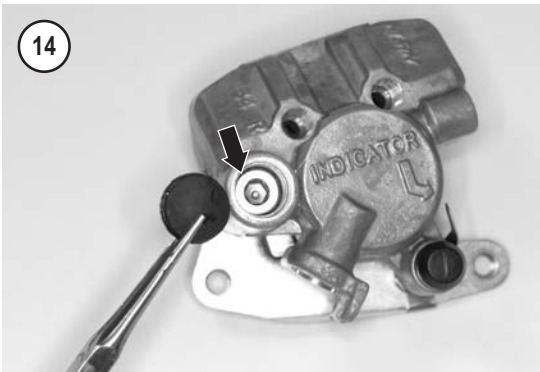
Refer to **Figure 1**.

1. Remove the front wheel as described in Chapter Ten.
2. Drain the brake fluid from the brake line as follows:
 - a. Remove the rubber cap from the bleed valve (**Figure 11**).
 - b. Attach a length of tubing to the valve so the brake fluid can be drained into a container (**Figure 12**).
 - c. Loosen the bleed valve and drain the brake fluid. Squeeze the brake lever to aid the flow of fluid.
 - d. Close the bleed valve and disconnect the drain tube.
3. Remove the banjo bolt and seal washers from the brake hose (C, **Figure 2**). Have a shop cloth and container nearby to catch the brake fluid that drips from the hose.

CAUTION

Wrap the hose end to prevent brake fluid from damaging other surfaces. Wipe up fluid spills and wash your hands to make sure brake fluid does not get on painted or plastic surfaces.





Dispose of fluid in an environmentally safe manner.

4. Remove the caliper mounting bolts (B, **Figure 2**) and then remove the caliper.
5. Repair the caliper as described in this section.
6. Reverse this procedure to install the caliper. Observe the following:
 - a. Position the brake hose fitting so it lays flat and is seated in the groove at the back of the caliper (**Figure 13**).
 - b. Install the *new* seal washers on the banjo bolt.
 - c. Install new caliper mounting bolts.
 - d. Tighten the caliper mounting bolts to 30 N•m (22 ft.-lb.).
 - e. Tighten the brake hose banjo bolt to 34 N•m (25 ft.-lb.).
 - f. Fill the brake fluid reservoir and bleed the brakes as described in Chapter Three.

Repair

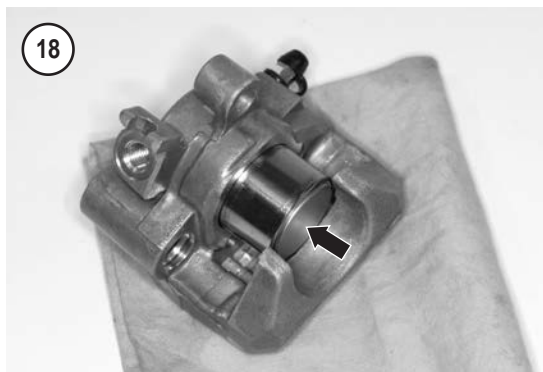
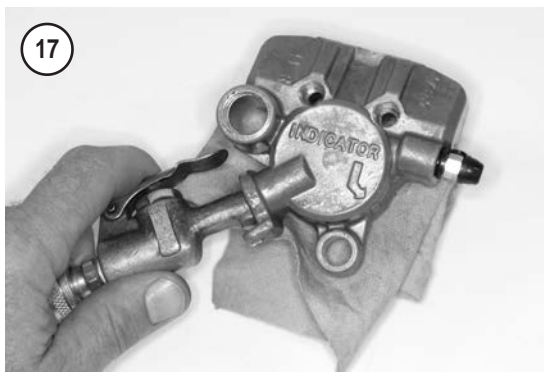
Refer to **Figure 1**.

1. Remove the caliper as described in this section.
2. Remove the brake pads and pad pins as described in *Front Brake Pads/Replacement* in this chapter.
3. Remove the dust plug and slide pin (**Figure 14**), then remove the caliper bracket, washer, slide pin and boots (**Figure 15**).
4. Remove the pad spring (**Figure 16**).

WARNING

In the following step, an air nozzle is held tightly in the brake hose fitting and the air pressure pushes the piston out. Do not pry the piston out of the caliper. Read the following procedure entirely before beginning removal. Wear eye protection when using compressed air to remove the piston. Keep fingers away from the piston.

5. Remove the piston from the caliper as follows:
 - a. Place the caliper on a padded work surface.
 - b. Close the bleeder valve on the caliper so air cannot escape.
 - c. Place a folded shop cloth in the caliper. The pad cushions the piston when it comes out of the caliper.
 - d. Lay the caliper so the pistons will discharge downward.



- e. Insert an air nozzle into the brake hose fitting (**Figure 17**). If the nozzle does not have a rubber tip, wrap the nozzle tightly with tape to seal it and prevent thread damage.
- f. Place a shop cloth over the entire caliper to catch any discharge from the caliper.
- g. Apply pressure and listen for the piston to pop from the caliper (**Figure 18**).

6. Remove the bleeder valve and piston seals (**Figure 19**). When removing the seals, avoid contacting the piston bore with tools or other objects that could scratch the surface.



7. Inspect the caliper assembly as follows. Replace worn, corroded or deteriorated parts.

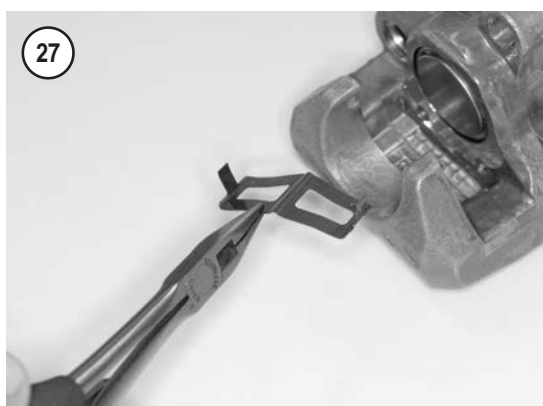
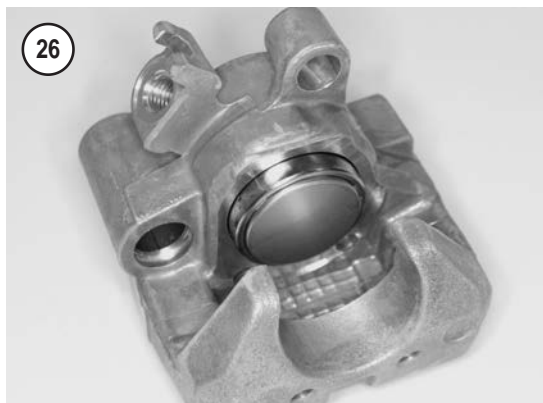
- a. Clean all parts to be reused with fresh brake fluid or isopropyl (rubbing) alcohol. Use a wood or plastic-tipped tool to clean the seal grooves.
- b. Inspect the cylinder bore for wear, scratches, pitting and corrosion.
- c. Measure the inside diameter of the piston bore (**Figure 20**). Refer to **Table 1**.
- d. Measure the outside diameter of the piston (**Figure 21**). Refer to **Table 1**.
- e. Inspect the caliper bracket, washer, slide pin and boots (**Figure 15**).
- f. Inspect the brake pads, pad pins and pad spring (**Figure 22**).
- g. Inspect the bleeder and cap. Check the threads and seat on the bleeder (**Figure 23**) for corrosion and damage.



NOTE

Use new DOT 4 brake fluid to lubricate the piston and seals in the following assembly steps.

8. Install the new seals and piston as follows:



- Soak the seals in brake fluid for 5 minutes.
- Coat the caliper bore and piston with brake fluid.
- Seat the piston seal (A, **Figure 24**), then the dust seal (B) into the caliper grooves. The piston seal goes in the back groove (**Figure 25**).
- Install the piston with the flat end facing out (**Figure 26**). The piston does not go straight into the bore. Twist the piston past the seals, and then press the piston to the bottom of the bore.

9. Seat the pad spring into the mounting bracket (**Figure 27**). The tabs at the ends of the spring must face up.

10. Insert the boots into the caliper (**Figure 28**). Lightly lubricate the exterior of the boots with silicone brake grease to aid in installation. After the boots are installed, pack the interior of the bracket pin boot with silicone brake grease.

11. Pack silicone brake grease into the slide pin groove (**Figure 29**), and then install the pin. Make

sure the ribs on the slide pin boot are seated in the caliper and slide pin.

12. Place the washer over the end of the slide pin (**Figure 30**).

NOTE

The washer is a spring washer and should not be completely flat. Replace the washer if it is flat.

13. If necessary, assemble the caliper bracket (**Figure 31**), and then mount the bracket onto the caliper.

14. Screw the slide pin into the caliper bracket and tighten the pin (**Figure 32**) to 22 N•m (17 ft.-lb.).

15. Install the dust plug over the slide pin.

16. Install the bleeder valve.

17. Install the brake pads, pad pins and plugs as described in *Front Brake Pads* in this chapter.

18. Install the caliper as described in this section.

19. Fill the brake fluid reservoir and bleed the brakes as described in Chapter Three.

FRONT MASTER CYLINDER

Removal/Installation

Refer to **Figure 33**.

1. Park the vehicle on level ground and set the parking brake.

2. Remove the handlebar cover as described in Chapter Fourteen.

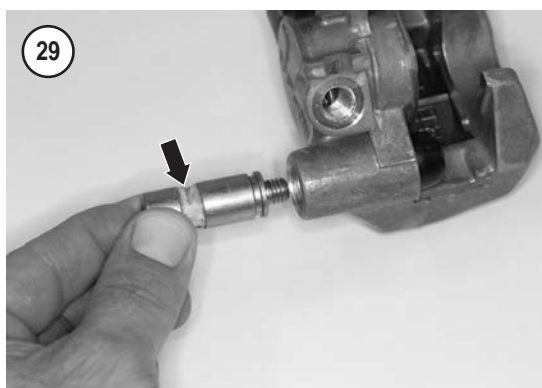
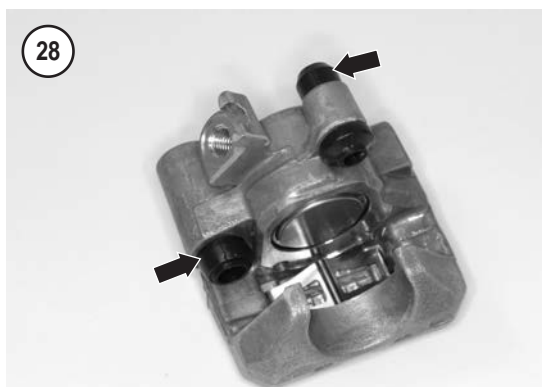
CAUTION

Brake fluid damages the finish on painted, plated or plastic surfaces. If brake fluid should spill on any surface, wash the area immediately with soapy water and rinse completely.

3. Drain the brake fluid as described in this chapter.

4. Cover the area under the master cylinder to prevent brake fluid from damaging any component that it might contact.

5. Remove the banjo bolt (**Figure 34**) and disconnect the brake hose from the master cylinder. Watch for the two sealing washers on either side of the brake hose fitting. Place the loose end of the brake hose into a reclosable bag so brake fluid does not drip onto frame components. Tie the brake hose to the handlebar.

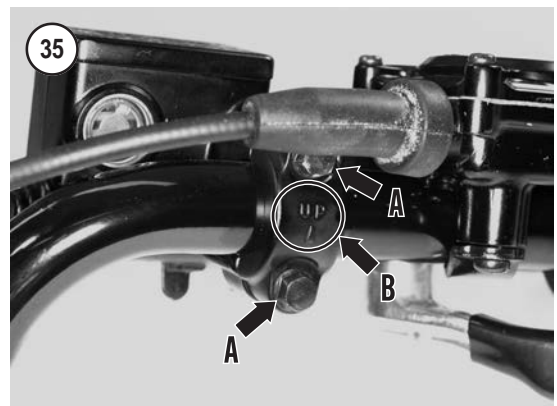
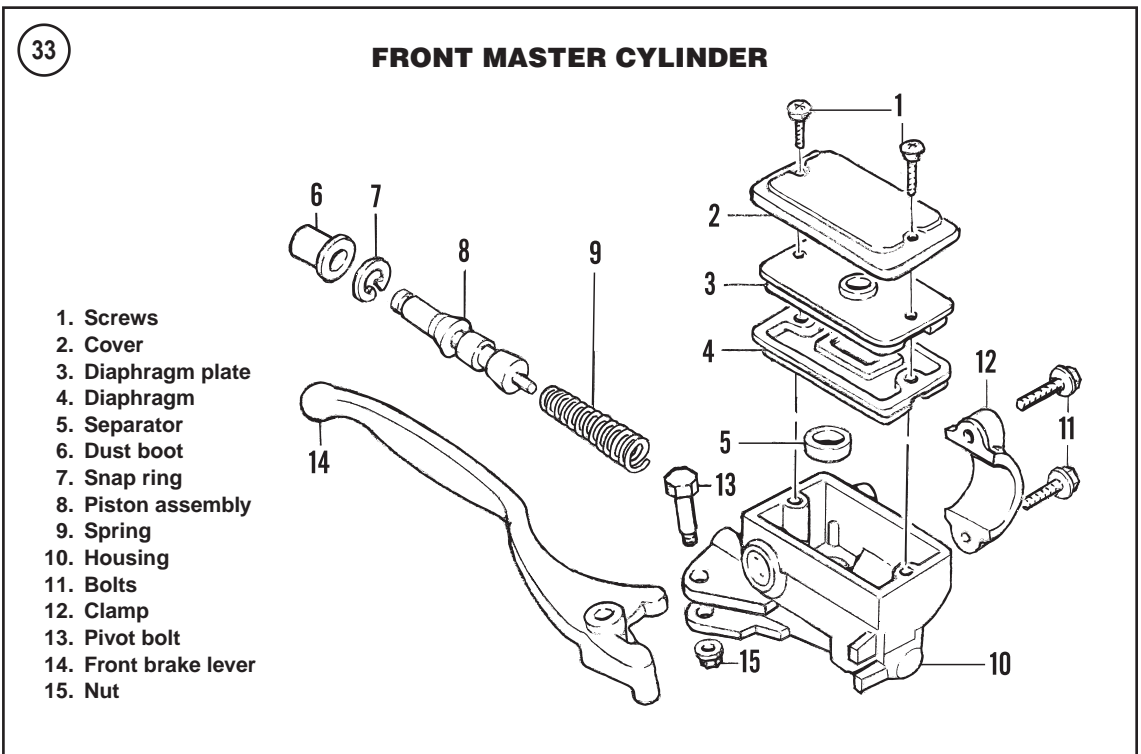


6. Unscrew the master cylinder clamp bolts (A, **Figure 35**). Remove the clamp and the master cylinder from the handlebar.

7. If necessary, service the master cylinder as described in this section.

8. Clean the handlebar, master cylinder and clamp mating surfaces.

9. Fit the master cylinder and its clamp into place on the handlebar. Position the clamp so its UP mark (B, **Figure 35**) faces up.



10. Align the edge of the master cylinder housing with the punch mark (**Figure 36**) on the handlebar.
11. Install the master cylinder clamp bolts. Tighten the bolts to 12 N•m (106 in.-lb.). Tighten the upper bolt first and then the lower bolt.
12. Connect the brake hose to the master cylinder with the banjo bolt and two new washers. Install a washer on each side of the hose fitting. Tighten the banjo bolt (**Figure 34**) to 34 N•m (25 ft.-lb.).
13. Refill the master cylinder reservoir with DOT 3 or DOT 4 brake fluid until the fluid level rises to the upper limit line (**Figure 37**).
14. Bleed the brakes as described in this chapter.

WARNING

Do not ride the vehicle until the front brakes are working properly. Make sure the brake lever travel is not excessive and the lever does not feel spongy. Either condition indicates the bleeding operation must be repeated.

15. Install the handlebar cover (Chapter Fourteen).

Disassembly

Refer to **Figure 33**.

1. Remove the master cylinder as described in this section.
2. Remove the nut, pivot bolt and front brake lever.
3. Remove the screws, top cover, diaphragm plate, diaphragm and float.
4. Pour out any brake fluid, and discard it properly.
5. Remove the dust boot (**Figure 38**) from the end of the piston and piston bore.

NOTE

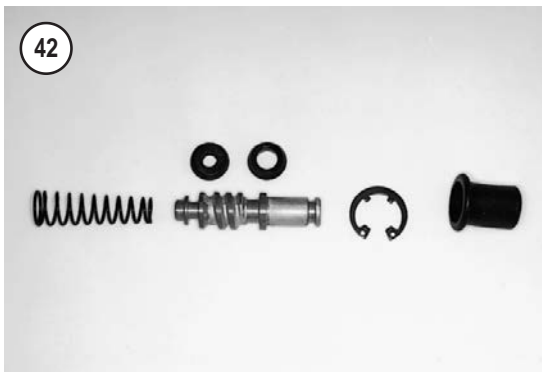
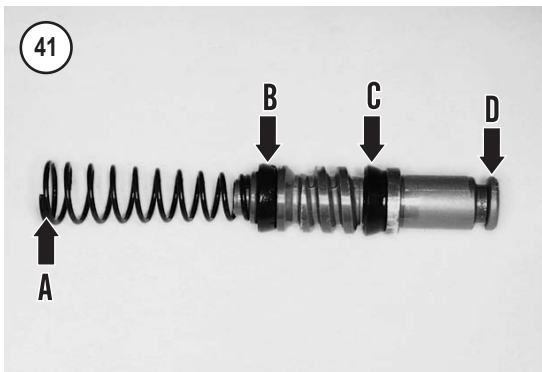
If brake fluid leaks from the piston bore, the piston cups are worn or damaged. Replace the piston assembly.

NOTE

*To hold the master cylinder when removing and installing the snap ring, thread a bolt with a nut into the master cylinder. Tighten the nut against the master cylinder to lock the bolt in place, and then clamp the bolt and nut in a vise as shown in **Figure 39**.*

6. Compress the piston and remove the snap ring (**Figure 40**) from the master cylinder bore.





7. Remove the piston and spring assembly (**Figure 41**).

8. Inspect the master cylinder as described in this section.

Assembly

1. Use new DOT 4 brake fluid when brake fluid is called for in the following steps. Do not use DOT 5 (silicone based) brake fluid.

2A. When installing a new piston assembly (**Figure 42**), perform the following:

- Soak the new primary and secondary cups in new brake fluid for at least 15 minutes to make it pliable.
- Lubricate the new piston with brake fluid.
- Install the primary cup over the piston and seat it in the groove as shown in B, **Figure 41**.
- Install the new secondary cup and seat it in its groove in its piston. Refer to C, **Figure 41**.

2B. If reusing the original piston assembly, lubricate it with brake fluid.

CAUTION

When installing the piston assembly into the master cylinder bore, do not allow the cups to turn inside out. This damages them and allows brake fluid to leak out of the bore.

3. Assemble the spring/piston assembly as shown in **Figure 41**.

4. Install the spring/piston assembly into the master cylinder bore. Check that the cups did not turn inside out or fold over themselves.

5. Push the piston into the bore. Hold it in place, and then install the snap ring (**Figure 40**). Install the snap ring with its flat edge facing out (away from the piston). Check that the snap ring is fully seated in the bore groove. Push and release the piston a few times. It should move smoothly and return under spring pressure.

6. Slide the dust boot—shoulder side first—over the piston. Seat the small boot lip into the groove in the end of the piston (**Figure 43**). Make sure it is correctly seated in the cylinder bore (**Figure 38**).

7. Install the brake lever by performing the following:

- Install the brake lever and its pivot bolt. Tighten the pivot bolt to 6 N•m (53 in.-lb.).

Operate the brake lever, making sure it moves smoothly.

- b. Install the brake lever pivot locknut. Hold the pivot bolt and tighten the locknut to 6 N•m (53 in.-lb.). Operate the brake lever again. It should move smoothly with no roughness or binding.
8. Temporarily install the master cylinder cover assembly.
9. Install the master cylinder as described in this section.

Inspection

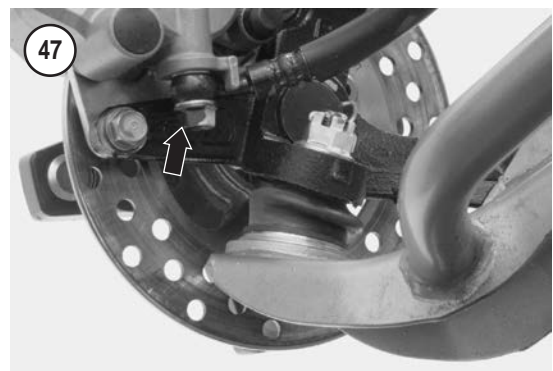
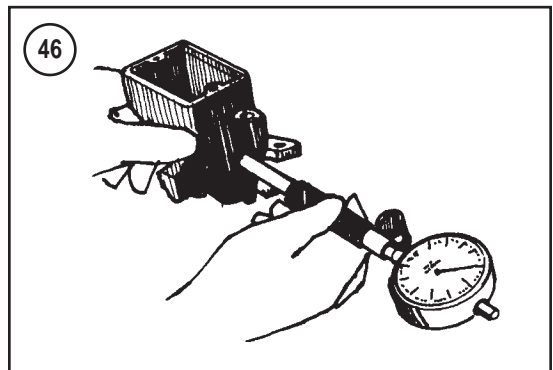
When inspecting master cylinder components, compare any measurements to the specification in **Table 1**. Replace parts that are out of specification or damaged.

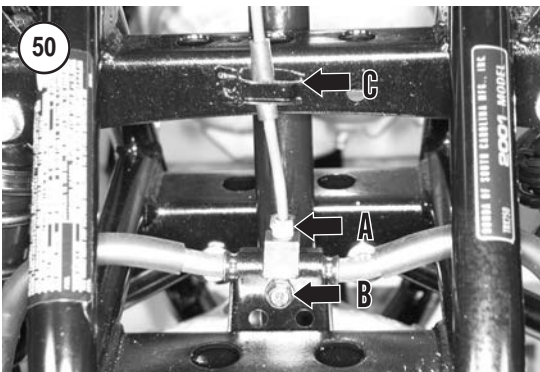
1. Clean the diaphragm, reservoir housing (inside) and the piston assembly with new brake fluid. Place the parts on a clean lint-free cloth.

NOTE

Do not remove the primary or secondary cup from the piston during inspection. If either is damaged, replace the entire piston assembly. Leave the cups in place for reference when installing the new cups onto the new piston.

2. Inspect the piston assembly for:
 - a. Broken, distorted or collapsed piston return spring (A, **Figure 41**).
 - b. Worn, cracked, damaged or swollen primary (B, **Figure 41**) and secondary cups (C).
 - c. A scratched, scored or damaged piston (D, **Figure 41**).
 - d. If any of these parts are worn or damaged, replace the piston assembly. Individual parts are not available separately from Honda.
3. Inspect the snap ring for corrosion, rust, weakness or other damage. Replace the snap ring if necessary.
4. Inspect the boot. Replace it if damaged.
5. Measure the piston outside diameter (**Figure 44**).
6. Inspect the cylinder bore (**Figure 45**) for scratches, pitting, excessive wear, corrosion or other damage. Do not hone the bore to remove nicks, scratches or other damage.
7. Measure the cylinder bore diameter (**Figure 46**).



**CAUTION**

A plugged relief port causes the brake pads to drag on the disc.

8. Check for plugged supply and relief ports in the master cylinder. Clean the ports with compressed air.
9. Check the entire master cylinder body for wear or damage.
10. Check the cover and diaphragm assembly for damage.
11. Inspect the bolt threads in the brake fluid port in master cylinder. Repair minor damage with the cor-

rect size metric tap or replace the master cylinder assembly.

12. Check the hand lever pivot holes and the mounting lugs on the master cylinder body for elongation or cracks. If damaged, replace the master cylinder assembly.

13. Inspect the hand lever and pivot bolt. Replace it if damaged.

BRAKE HOSE REPLACEMENT**NOTE**

The following describes the procedure for replacing the caliper hoses, brake pipe and the master cylinder hose. If the entire brake line does not need replacing, perform just the appropriate part of this procedure.

1. Drain the brake fluid from the front brake system as described in this chapter.
2. Remove the handlebar and front cover as described in Chapter Fourteen.

CAUTION

Because some residual brake fluid remains in the lines, be careful when disconnecting and removing the brake hoses.

3. Remove the banjo bolts from one caliper (**Figure 47**). Watch for the sealing washers on either side of the brake hose fitting.
4. Insert the brake hose end into a reclosable plastic bag so brake fluid does not drip onto the suspension components.
5. Remove the brake hose clamp bolts (**Figure 48** and **Figure 49**), and disconnect each clamp from the hose.
6. Repeat Steps 2-5 for the brake hose on the other wheel.
7. Loosen the lower brake pipe nut (A, **Figure 50**) at the brake hose union.
8. Remove the union mounting bolt. Separate the union from the brake pipe, and insert the brake pipe end into a reclosable plastic bag.
9. Remove the brake hose/union assembly from the frame.
10. Loosen the upper brake pipe nut (A, **Figure 51**).
11. Release the master cylinder brake hose from the clamp (B, **Figure 51**) and insert the hose end into a reclosable plastic bag.

12. Release the brake pipe from the lower clamp (C, **Figure 50**), and remove the brake pipe.
13. Remove the banjo bolt (**Figure 34**) and disconnect the brake hose from the master cylinder. Watch for the sealing washers on either side of the brake hose fitting.
14. Release the brake hose from the clamp (**Figure 52**), and remove the master cylinder hose.

WARNING

Do not ride the vehicle until the brakes are operating properly.

15. Installation is the reverse of removal. Note the following:

- a. Use new sealing washers on either side of the hose fitting when installing each banjo bolt.
- b. Apply oil to the threads and flanges surfaces of the brake pipe mounting hardware.
- c. Secure the hose/pipe with the clamps noted during removal.
- d. Tighten the banjo bolts, brake hose clamp bolts and brake pipe to the specifications in **Table 2**.

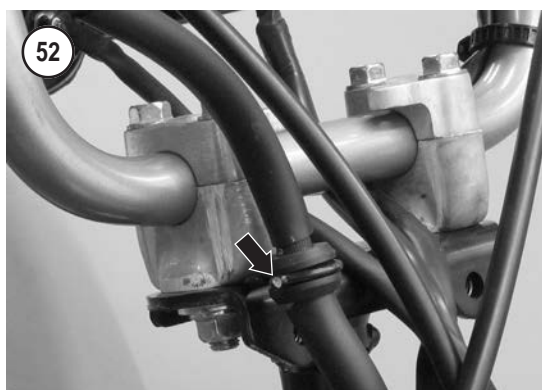
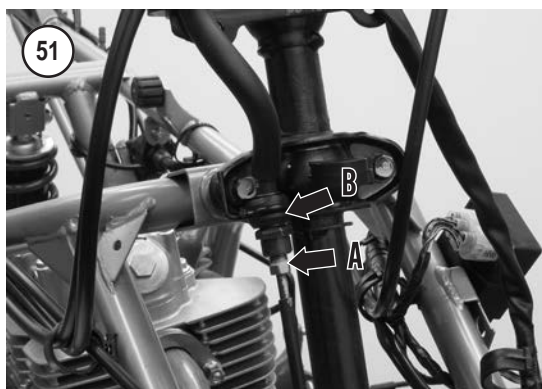
BRAKE FLUID DRAINING

An empty bottle, a length of clear hose (**Figure 53**) that fits tightly onto the wheel cylinder bleed valve and a wrench to open and close the bleed valve are needed for this procedure. A vacuum pump (**Figure 54**) can also be used to drain the brake system.

1. Turn the handlebar so the front master cylinder is level with the ground.
2. Remove the reservoir cover and diaphragm assembly (**Figure 55**).
3. Connect a hose to one of the wheel cylinder bleed valves (A, **Figure 56**). Insert the other end of the hose into a clean bottle.
4. Loosen the bleed valve and pump the brake lever to drain part of the brake system.
5. Close the bleed valve when fluid stops flowing through the valve.
6. Repeat Steps 3-5 for the other side. Because air has entered the brake lines, not all of the brake fluid drains out.

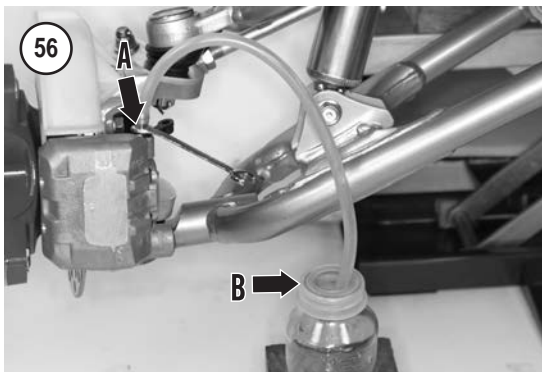
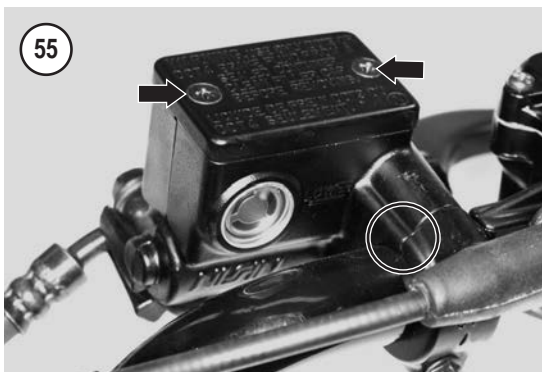
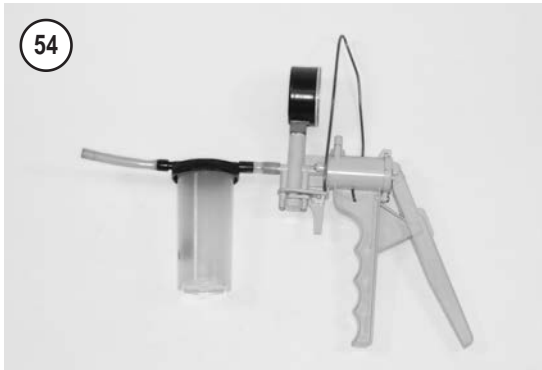
CAUTION

Because some residual brake fluid remains in the lines, be careful when



disconnecting and removing the brake hoses during service.

7. Reinstall the diaphragm assembly and reservoir cover.
8. Perform the required service to the front brake system as described in this chapter.
9. After servicing the brake system, bleed the front brakes as described in this chapter.



BRAKE BLEEDING

Bleed the front brakes when they feel spongy, after a brake hose has been removed, when replacing parts in the system or when replacing the brake fluid.

This section describes two methods for bleeding the brake system. The first requires a vacuum pump (Figure 54) and the second requires a container and a piece of clear tubing (Figure 53).

1. Remove the dust cap from the bleed valve on a wheel cylinder.

2A. If using a vacuum pump, assemble the pump by following the manufacturer's instructions. Connect the vacuum pump hose to the wheel cylinder bleed valve.

2B. If a vacuum pump is not being used, perform the following:

- Connect a piece of clear tubing onto the bleed valve (A, Figure 56).
- Insert the other end of the tube into a container partially filled with new brake fluid (B, Figure 56). Tie the tube in place so it cannot slip out of the container.

3. Clean all debris from the master cylinder cover.

4. Turn the front wheels so the master cylinder is level with the ground.

CAUTION

Brake fluid damages the finish on plastic, painted or plated surface. Wash any spilled fluid from these surfaces immediately. Clean the area with soapy water and rinse completely.

5. Cover the area under the master cylinder with plastic to protect the parts in the event of brake fluid spills.

6. Remove the cover screws (Figure 55) and master cylinder cover and diaphragm assembly.

WARNING

Use DOT 4 brake fluid from a sealed container. Do not mix different brands of fluid. Do not use silicone-based DOT 5 brake fluid because it can damage the brake components, leading to brake system failure.

7. Add DOT 4 brake fluid to the reservoir until the fluid level reaches the upper limit line.

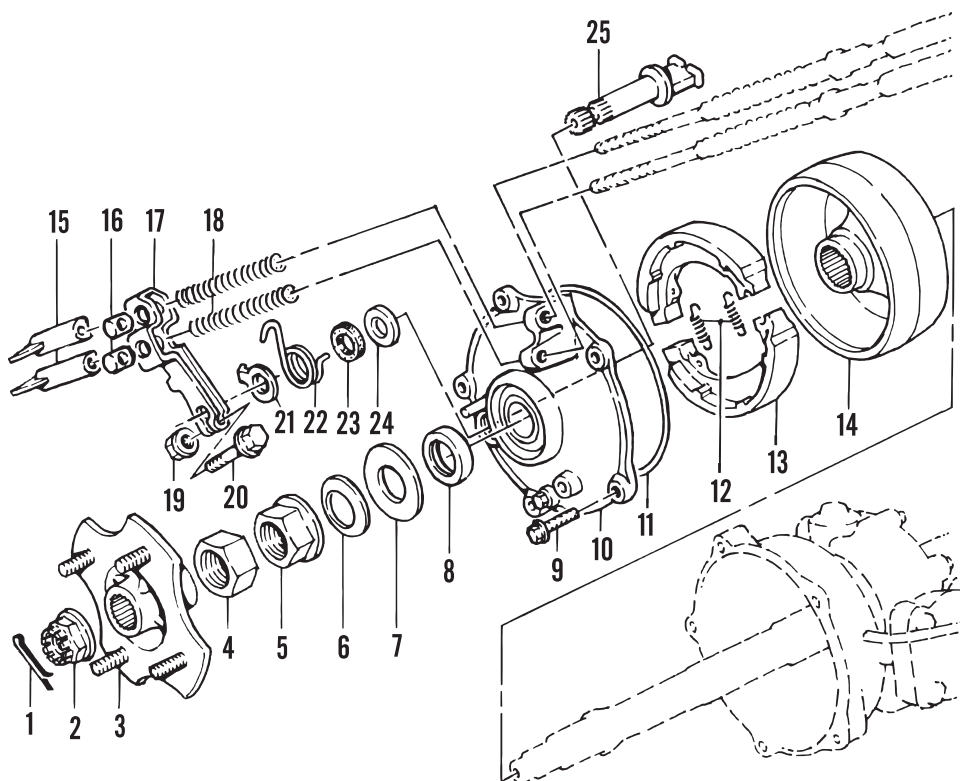
NOTE

When bleeding the front brake, frequently check the fluid level in the master cylinder. If the reservoir runs dry, air enters the system. If this occurs, the entire procedure must be repeated.

8A. When using a vacuum pump, perform the following:

- Operate the vacuum pump several times to create a vacuum in the attached hose.

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REAR BRAKE

1. Cotter pin
2. Hub nut
3. Rear hub
4. Axle locknut
5. Axle nut
6. Spring washer
7. Thrust washer
8. Collar/ring seal
9. Bolt

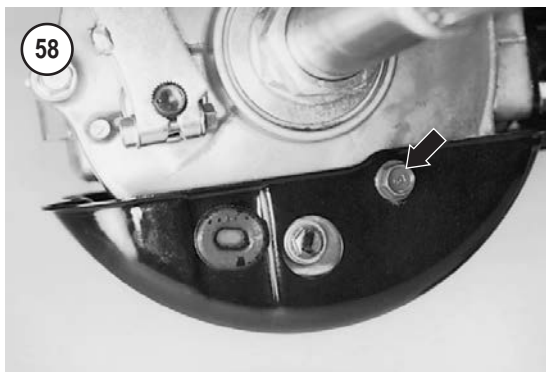
10. Brake panel
11. O-ring
12. Return spring
13. Brake shoe
14. Brake drum
15. Brake adjuster
16. Barrel connector
17. Brake arm
18. Spring

19. Nut
20. Bolt
21. Pointer
22. Spring
23. Brake cam felt seal
24. Brake cam dust seal
25. Brake cam

- b. Open the bleed valve 1/4 turn to allow extraction of air and fluid through the line. When the flow of air and fluid starts to slow down, close the bleed valve.
- c. Operate the brake lever several times and release it.
- d. Check the fluid level in the master cylinder. Refill the reservoir as necessary.
- e. Repeat substeps a-d until no air bubbles emerge from the bleed valve and until a solid feel is noted when the brake lever is operated.
- f. Repeat for the opposite brake line.

8B. If a vacuum pump is not being used, perform the following:

- a. Operate the brake lever several times until resistance is felt, and then hold it in its applied position. If the system was opened or drained completely, there is no initial resistance at the brake lever.
- b. Open the bleed valve 1/4 turn and allow the lever to travel to its limit. Close the bleed valve and release the brake lever.
- c. Check the fluid level in the master cylinder. Refill the reservoir as necessary.



10. Tighten the bleed valve to 6 N•m (53 in.-lb.). Snap the dust cap onto the bleed valve.

11. If necessary, add fluid to the upper level line in the reservoir. It should be to the upper level line inside the master cylinder reservoir.

12. Install the diaphragm and cover. Tighten the screws securely.

13. Recheck the feel of the brake lever. It should be firm and offer the same resistance each time it is operated. If the lever feels spongy, check all the hoses for leaks, and bleed the system again.

REAR BRAKE DRUM

Brake Drum Removal

WARNING

*When working on the brake system, never blow off brake dust with compressed air. **Do not inhale** any airborne brake dust. It may contain asbestos, which can cause lung injury and cancer. As an added precaution, wear an OSHA approved face mask and thoroughly wash your hands and forearms with warm water and soap after completing any brake work.*

Two 41-mm wrenches are needed to remove the axle nuts.

Refer to **Figure 57**.

1. Park the ATV on level ground and set the parking brake.

2. Remove the right rear wheel and hub as described in Chapter Ten.

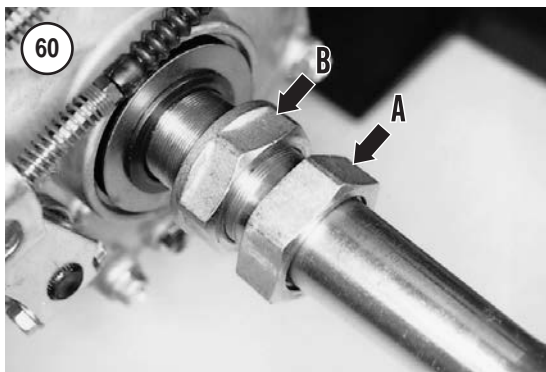
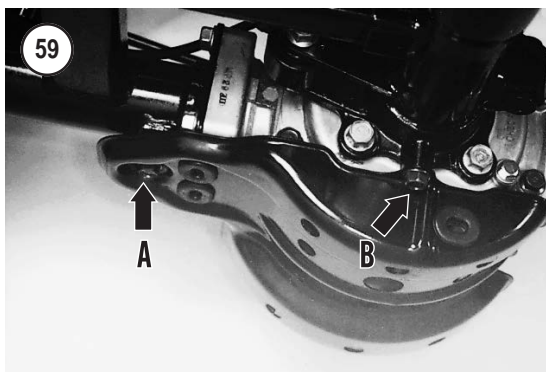
3. Remove the right skid plate bolt (**Figure 58**).

4. Remove the front skid plate bolt (A, **Figure 59**) and left bolt (B) and lower the skid plate from the final drive unit.

5. Note the differences between the axle nut and axle locknut. They must be reinstalled in the same relative positions. The axle locknut (A, **Figure 60**) has two internal shoulders. The side with the deeper shoulder faces toward the axle nut. The axle nut (B, **Figure 60**) has an external shoulder that faces toward the spring washer.

6. Use the 41-mm wrenches to remove the axle locknut (A, **Figure 60**) and then the axle nut (B).

7. Remove the spring washer (A, **Figure 61**) and thrust washer (B).



- d. Repeat substeps a-c until no air bubbles emerge from the bleed valve and until solid feel is felt when the brake lever is operated.
- e. Repeat for the opposite brake line.

NOTE

If you are flushing the system, continue Step 8 until the fluid expelled from the system is clean.

9. Remove the vacuum pump or the container and hose from the bleed valve.

8. Disconnect the rear brake lever/parking brake cable (upper cable) from the brake arm by performing the following:

- Unscrew the adjuster (A, **Figure 62**) from the end of the parking brake cable.
- Remove the barrel connector (B, **Figure 62**) and spring (C) from the cable.
- Remove the cable from the boss (D, **Figure 62**) on the brake panel.

9. Disconnect the rear brake pedal cable (lower cable) from the brake arm by repeating the procedures in Step 8.

10. Remove the five brake panel bolts (**Figure 63**).

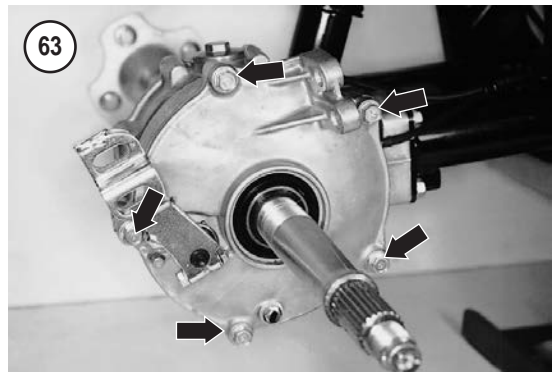
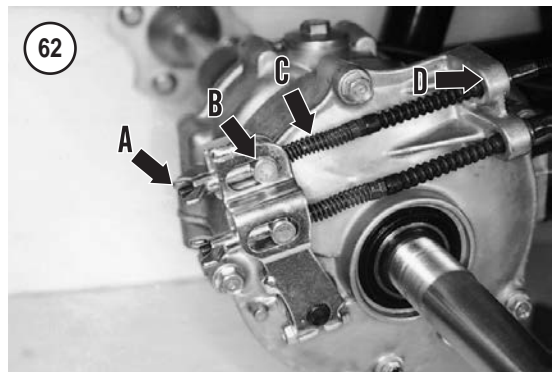
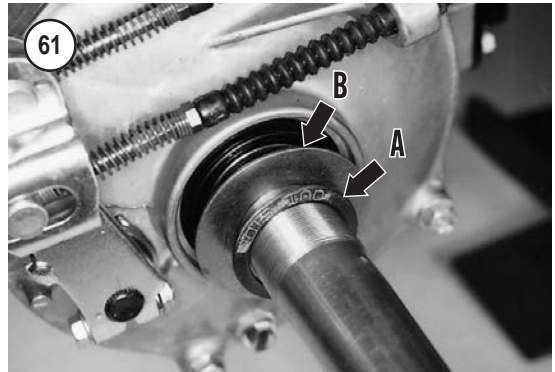
11. Carefully pry the brake panel at the two pry points (**Figure 64**). If necessary, use a slide hammer to separate the brake panel from the final drive unit (**Figure 65**).

12. Remove the collar/ring seal (**Figure 66**) assembly from the brake panel oil seal, and then remove the brake panel. Discard the brake panel O-ring. A new one must be installed during assembly.

13. Slide the brake drum (**Figure 67**) from the final drive unit, and remove it from the axle.

14. Inspect the brake drum as described in this section.

15. Disassemble and inspect the brake panel as described in this section.



Brake Drum Installation

1. Clean all grease and threadlocking compound from the threads on the axle.

2. Align the inner splines of the brake drum (A, **Figure 68**) with those of the axle, and slide the drum (**Figure 67**) along the axle until it bottoms in the final drive gearcase.

3. Lubricate a new O-ring with multipurpose lithium grease and install the O-ring (**Figure 69**) onto the brake panel.

4. Slide the brake panel over the axle and seat it against the final drive unit.

5. Install and finger-tighten the five brake panel bolts (**Figure 63**). Using a crisscross pattern, evenly tighten the bolts in two or three stages.

6. Install the collar/ring seal (**Figure 66**) and seat it in the brake panel dust seal. Make sure the ring seal side faces away from the brake panel.

7. Connect the rear brake lever/parking brake cable (upper cable) to the brake arm by performing the following:



- a. Route the cable through the boss (D, **Figure 62**) on the brake panel.
- b. Fit the barrel connector (B, **Figure 62**) into place in the brake arm.
- c. Slide the spring (C, **Figure 62**) over the cable end and feed the cable through the hole in the barrel connector.
- d. Thread the adjuster (A, **Figure 62**) onto the cable end.

8. Connect the rear brake pedal cable (lower cable) to the brake arm by performing the procedures in Step 7.

9. Install the thrust washer (B, **Figure 61**) and spring washer (A). Make sure the side marked OUT faces away from the thrust washer.



NOTE

*Because the axle nut wrenches change the effective lever length of the torque wrench, use an adjusted torque setting to compensate for the change in lever length. Refer to **Torque Adapters** in Chapter One.*

10. Install the axle nut (B, **Figure 60**). The side with the external shoulder must face toward the spring washer. Tighten the axle nut to 39 N•m (29 ft.-lb.).

11. Apply ThreeBond 1303, or its equivalent, to the locknut threads and install the axle locknut (A, **Figure 60**). The side with the deeper shoulder must face toward the axle nut. While holding the axle nut, tighten the axle locknut to 127 N•m (94 ft.-lb.).

12. Install the skid plate. Tighten the skid plate bolts (A and B, **Figure 59** and **Figure 58**) to 32 N•m (24 ft.-lb.).

13. Install the right hub and wheel as described in Chapter Ten.



14. Adjust the rear brake as described in Chapter Three.

Brake Drum Inspection

When inspecting the brake drum, compare measurements to the specifications in **Table 1**. Replace the brake drum if any measurement is out of specification or if the drum is worn or damaged.

1. Inspect the rear brake panel as described in this section.

CAUTION

Do not clean the brake drum with any type of solvent that may leave an oil residue.

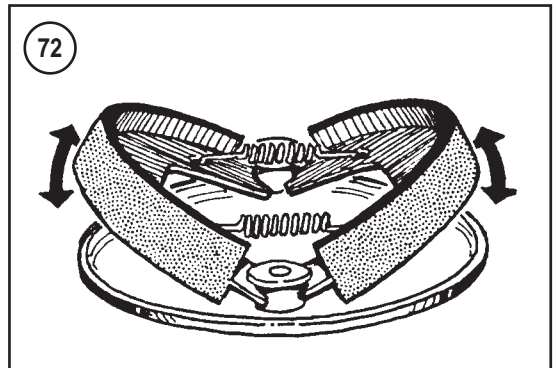
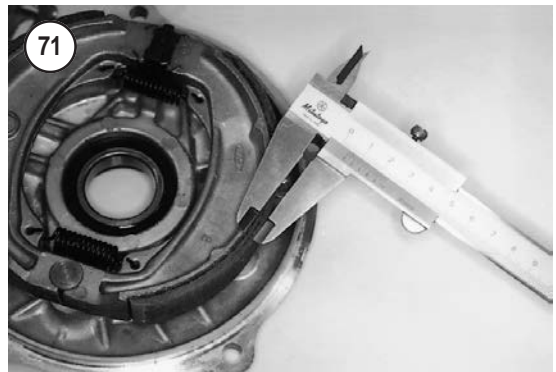
2. Check the brake drum surface (B, **Figure 68**) for oil or grease. Clean the surface with a rag soaked in brake parts cleaner. Check the brake shoe linings for contamination.
3. Check the drum contact surface (B, **Figure 68**) for scoring or other damage.
4. Inspect the brake drum for cracks or damage.
5. Inspect the drum splines (A, **Figure 68**) for twisting or damage.
6. Inspect the damper ring (C, **Figure 68**) for signs of wear or damage.
7. Measure the brake drum inside diameter (**Figure 70**).

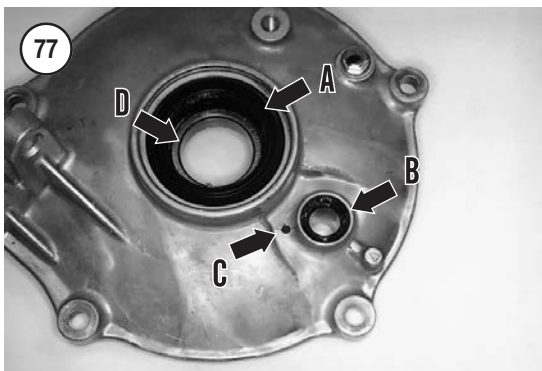
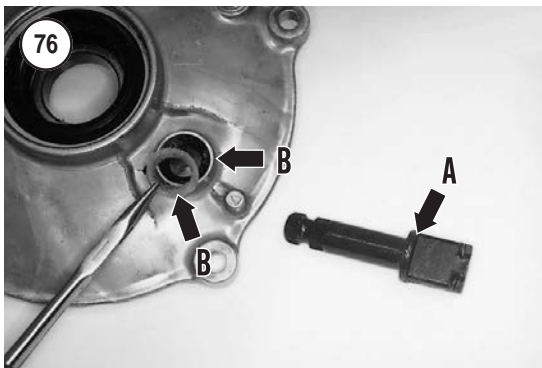
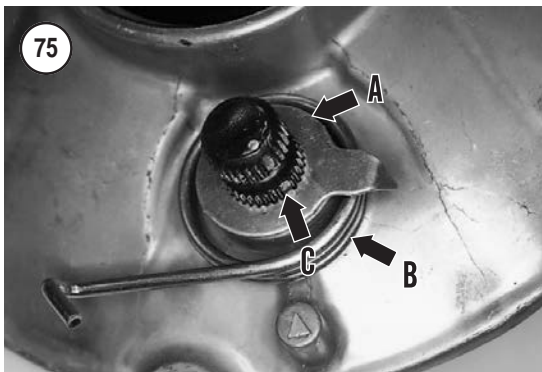
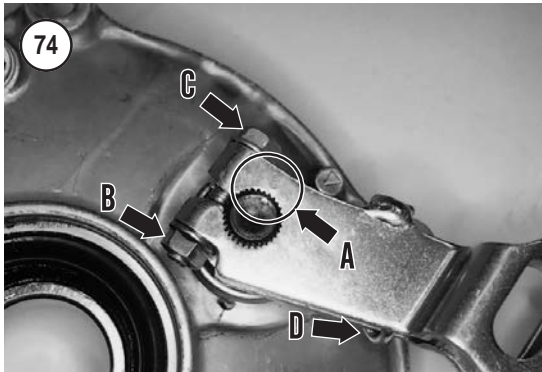
Brake Panel Disassembly

NOTE

Checking the rear brake lining is addressed in Chapter Three. However, always measure the brake linings and check for uneven wear when the rear brake panel is removed.

1. Measure the brake lining thickness (**Figure 71**) at several places with a vernier caliper. Replace both shoes if uneven wear is noted.
2. If the brake shoes are reused, mark them left and right so each shoe can be reinstalled in its original location.
3. Carefully lift the outside of both shoes in a V-formation (**Figure 72**), and remove the brake shoes and springs as an assembly (**Figure 73**).
4. Remove both brake springs (A, **Figure 73**) and separate the brake shoes.





5. Note the indexing mark (A, **Figure 74**) on the brake cam and brake arm. These marks should align. If necessary, make punch marks on each part so they can be reinstalled with the same relative positions.

6. Remove the brake arm nut (B, **Figure 74**) and bolt (C), and lift the brake arm from the brake cam.

7. Lift the pointer (A, **Figure 75**) and the spring (B) off the brake cam.

8. Remove the brake cam (A, **Figure 76**) from the brake panel.

9. Remove the felt seal (B, **Figure 76**) from the brake cam dust seal.

10. Inspect the brake panel as described in this section.

Brake Panel Assembly

1. Apply a multipurpose lithium grease to the dust seals (A and B, **Figure 77**).

2. Apply oil to the felt seal, and set the seal (B, **Figure 76**) in place on the brake cam dust seal.

3. Apply a light coat of high-temperature brake grease onto the brake cam (A, **Figure 76**) and install the cam into the brake panel. Wipe any excess grease from the brake panel.

4. Install the brake cam spring (B, **Figure 75**). Make sure the tang on the spring sits in the hole (C, **Figure 77**) in the brake panel.

5. Install the pointer onto the brake cam. The tab on the pointer must engage the slot in the brake cam as shown in C, **Figure 75**.

6. Fit the brake arm onto the brake cam so the index marks are opposite one another as shown in A, **Figure 74**. Make sure the spring tang (D, **Figure 74**) engages the brake arm.

7. Install the brake arm clamp bolt (C, **Figure 74**) and clamp nut (B). Tighten the nut to 12 N•m (106 in.-lb.).

8. Apply a light coat of high-temperature brake grease to the anchor pin (B, **Figure 73**). Keep grease off any part of the brake panel that might come in contact with the brake linings.

9. Place the brake shoes opposite one another on the bench. If reusing the original brake shoes, position them so they are reinstalled in their original locations.

10. Attach the springs (A, **Figure 73**) to the brake shoes.

11. Hold the brake shoe/spring assembly in a V-formation with the shoes engaging the brake cam and anchor pin. Snap the shoes into place in the brake panel. Check that the ends of both springs are securely hooked onto the brake shoes. Refer to **Figure 69**.

Brake Panel Inspection

Replace any part that is worn or damaged.

1. Remove old grease from the brake cam (A, **Figure 76**), anchor pin (B, **Figure 73**) and brake panel.
2. Inspect the brake panel dust seal (A, **Figure 77**) and brake cam dust seal (B) for excessive wear or damage. Replace either dust seal if it is starting to harden or deteriorate. Refer to *Brake Panel Bearing Replacement* in this section.
3. Turn the inner race of the brake panel bearing (D, **Figure 77**) by hand. The race must turn smoothly. Also check that the outer race fits tightly into the brake panel. If necessary, replace the bearing as described in this section.
4. Inspect the O-ring (**Figure 69**) for excessive wear or damage.
5. Check the brake panel for cracks or other damage.
6. Inspect the splines on the brake cam and brake arm.
7. Check the brake cam spring (B, **Figure 75**) for cracks or signs of fatigue.

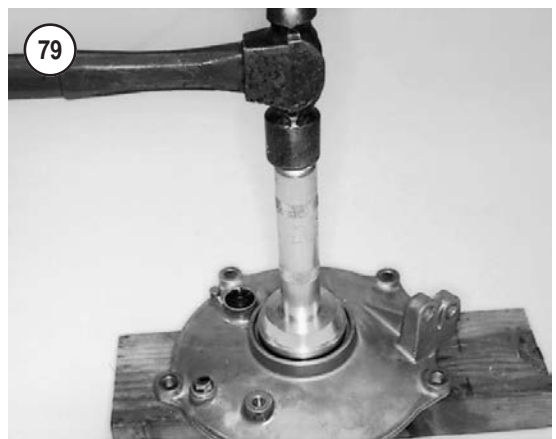
Brake Panel Bearing Replacement

1. Remove the brake shoes as described in *Brake Panel Disassembly* in this section.
2. Pry the dust seal (A, **Figure 77**) from the brake panel with the seal remover or other appropriate tool. Place a rag beneath the tool so the brake panel is not scratched.

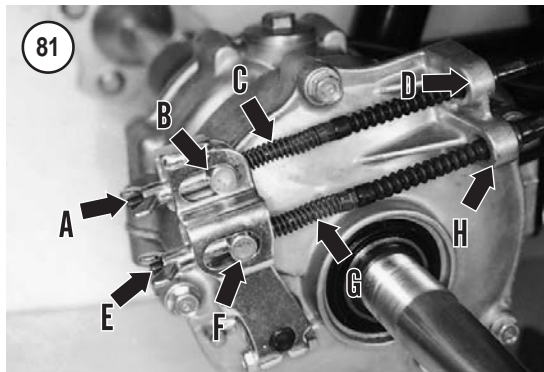
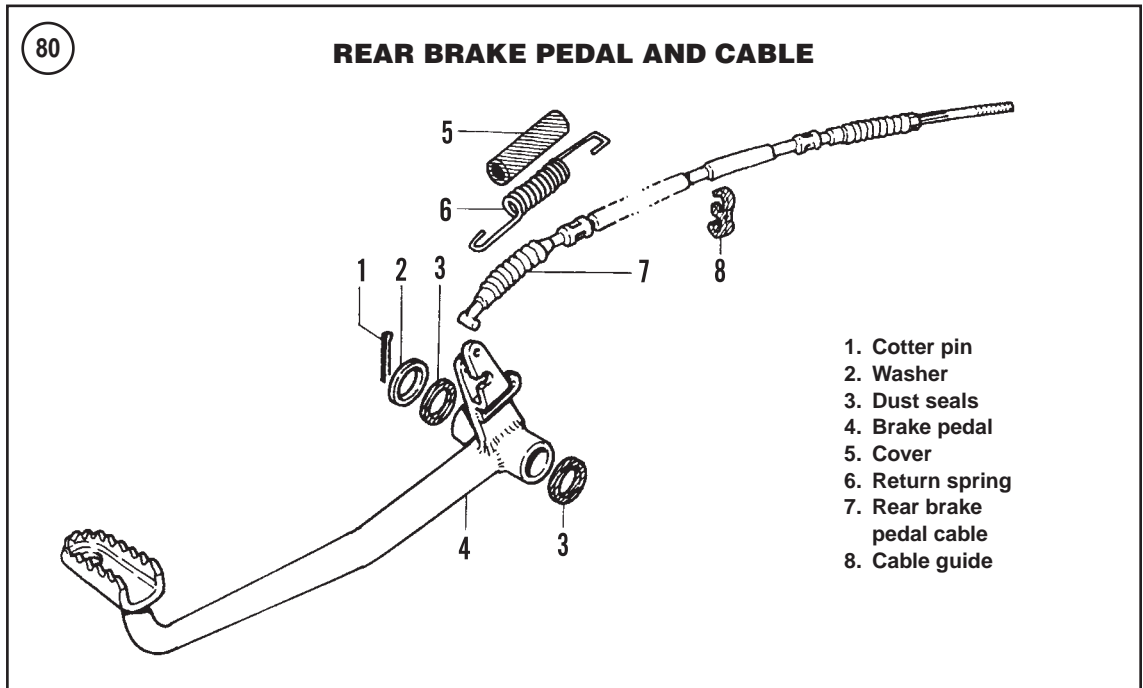
NOTE

If only replacing the dust seal, go to Step 8.

3. Remove the snap ring from the bearing bore.
4. Use a suitable side bearing driver or socket, and drive the bearing from the bearing bore (**Figure 78**).
5. Inspect the mounting bore for cracks, galling or other damage. Clean the mounting bore thoroughly.



6. Inspect the snap ring groove for cracks or other damage.
7. Use a suitable size driver or socket and drive the bearing into the bore (**Figure 79**) until the bearing bottoms. The snap ring groove must be visible above the bearing.
8. Install the snap ring into the mounting bore groove. Make sure the snap ring completely seats in the groove.
9. Install the new dust seal (A, **Figure 77**) as follows:
 - a. Pack the new dust seal lip with a multipurpose lithium grease.
 - b. Align the dust seal with the mounting bore so the side with the manufacturing marks faces out.
 - c. Use the appropriate size driver or socket to tap the dust seal into place until the upper surface of the seal aligns with the edge of the brake panel.



REAR BRAKE PEDAL AND CABLE

Removal/Installation

Refer to **Figure 80**.

1. Loosen and remove the rear brake pedal cable adjusting nut (E, **Figure 81**), barrel connector (F) and spring from the brake arm (G).
2. Disconnect the brake cable from the boss (H, **Figure 81**) on the brake panel.
3. Disconnect the brake return spring (A, **Figure 82**) from the brake pedal assembly.
4. Remove the cotter pin, washer (B, **Figure 82**) and brake pedal assembly from the frame pivot shaft.

5. Disconnect the brake cable (C, **Figure 82**) from the brake pedal.

6. When replacing the rear brake pedal cable, perform the following:

- a. Remove the rear brake cable from the frame, noting any cable guides or brackets that secure the cable in place.
- b. Lubricate the new brake cable as described in Chapter Three.
- c. Route the new rear brake pedal cable along the frame and through any cable guides or brackets.

7. Remove all old grease from the brake pedal pivot shaft.

8. Check the brake pedal dust seals. Replace them if excessively worn or damaged.

9. Pack the lips of the brake pedal dust seal with grease.

10. Apply lithium grease to the frame pivot shaft, brake pedal pivot bore and the brake cable end (brake pedal side).

11. Reconnect the brake cable to the brake pedal, and then install the brake pedal (C, **Figure 82**) onto its pivot shaft.

12. Install the washer (B, **Figure 82**), and secure the pedal to the shaft with a new cotter pin. Bend the cotter pin ends over to lock it in place. Operate the

brake pedal by hand, making sure it moves smoothly.

13. Reconnect the brake return spring (A, **Figure 82**) to the brake pedal.

14. Reconnect the rear brake pedal to the brake panel. Install the spring, collar and adjusting nut (E, **Figure 81**).

15. Adjust the rear brake as described in Chapter Three.

REAR BRAKE LEVER/ PARKING BRAKE CABLE

Removal/Installation

The handlebar mounted rear brake lever operates the rear brake and is also equipped with a lock that allows it to be used as a parking brake.

1. Remove the handlebar cover and front fender as described in Chapter Fourteen.

2. Loosen and remove the rear brake pedal cable adjusting nut (A, **Figure 81**), barrel connector (B) and spring from the brake arm (C).

3. Disconnect the brake cable from the boss (D, **Figure 81**) on the brake panel.

4. Roll the brake lever boot (A, **Figure 83**) off the lever housing.

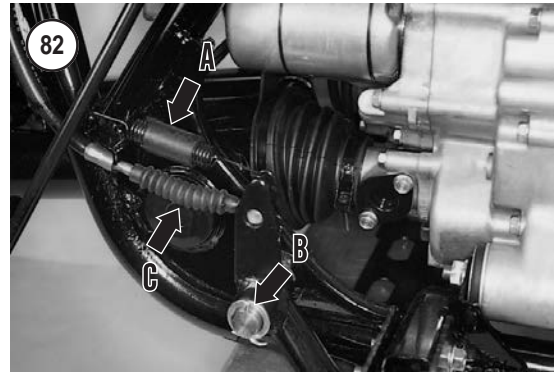
5. Disconnect the brake cable (B, **Figure 83**) from the brake lever.

6. Tie a long piece of heavy string to one end of the brake cable. As the brake cable is removed, the string follows the cable's original path so the new cable can be installed correctly.

7. Remove any clamps or cable guides securing the brake cable to the frame.

8. Pull the brake cable from the frame making sure the string follows the cable's original path.

9. Lubricate the new brake cable as described in Chapter Three.



10. Cut the string and tie it to the end of the new brake cable. Pull the string through the frame and route the new brake cable along the path of the original cable.

11. Reconnect the brake cable (B, **Figure 83**) to the brake lever.

12. Secure the brake cable with clamps or cable guides.

13. Reconnect the rear brake lever/parking brake cable to the brake panel. Install the spring, collar and adjusting nut (A, **Figure 81**).

14. Adjust the rear brake as described in Chapter Three.

Table 1 BRAKE SYSTEM SPECIFICATIONS

Item	New mm (in.)	Service limit mm (in.)
Front brakes		
Caliper cylinder inner diameter	33.96-34.01 (1.337-1.339)	34.02 (1.34)
Caliper piston outside diameter	33.895-33.928 (1.334-1.335)	33.87 (1.333)
Disc thickness	2.8-3.2 (0.11-0.13)	2.5 (0.10)
Disc runout		0.30 (0.012)
Rear brake		
Drum inside diameter	140.0 (5.51)	141.0 (5.55)
Lining thickness	4.5 (0.18)	To the indicator
Master cylinder inside diameter	12.700-12.743 (0.5000-0.5017)	12.755 (0.5022)
Master piston outside diameter	12.657-12.684 (0.4983-0.4994)	12.645 (0.4978)

Table 2 BRAKE SYSTEM TORQUE SPECIFICATIONS

Item	N•m	in.-lb.	ft.-lb.
Brake hose banjo bolt	34	—	25
Brake hose clamp bolts			
6 mm	12	106	—
8 mm	29	—	22
Brake lever pivot bolt	6	53	—
Brake lever pivot locknut	6	53	—
Brake pipe	17	—	12
Front brakes			
Caliper bleed valve	6	53	—
Caliper bracket pins	18	—	13
Caliper mounting bolts	30	—	22
Caliper pad pins	18	—	13
Caliper slide pins	22	—	17
Caliper pad pin plugs	3	27	—
Front brake disc bolts	42	—	31
Front wheel hub nut	69	—	51
Master cylinder clamp bolts	12	106	—
Master cylinder reservoir cap screw	2	18	—
Rear brake			
Rear axle nut	39	—	29
Rear axle locknut*	127	—	94
Rear brake arm clamp bolt/nut	12	106	—
Rear brake panel drain bolt	12	106	—
Rear wheel hub nut	148	—	108
Skid plate bolts	32	—	24

*Apply threadlocking compound.

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